UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/597,305	07/19/2006	Inpyo Choi	58049-00034	9091

35736 7590 04/28/2009

JHK LAW
P.O. BOX 1078
LA CANADA, CA 91012-1078

EXAMINER	
DUNSTON, JENNIFER ANN	
ART UNIT	PAPER NUMBER
1636	

MAIL DATE	DELIVERY MODE
04/28/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/597,305	CHOI ET AL.	
	Examiner	Art Unit	
	JENNIFER DUNSTON	1636	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 January 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *29-31,35 and 36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *29-31,35 and 36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 July 2006* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *7/19/2006; 7/20/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Receipt is acknowledged of an amendment, filed 7/19/2006, in which claims 1-7 were canceled, and claims 8-22 were newly added, and an amendment, filed 7/29/2008, in which claims 8-19 were canceled, and claims 23-34 were newly added. Receipt is also acknowledged of an amendment, filed 1/19/2009, in which claims 20-28 and 32-34 were canceled, and claims 35 and 36 were newly added. Currently, claims 29-31, 35 and 36 are pending.

Election/Restrictions

Applicant's election with traverse of Group II and ferritin H chain (BC 012314) in the reply filed on 1/19/2009 is acknowledged. The traversal is on the ground(s) that there is not an undue burden placed upon the Examiner to search and consider all of the claims. Further, the response asserts that the genes of claim 29 have common activity because the function of the genes is related to differentiation pNK cells to mNK cells and the genes were not known to be agents for differentiating premature NK cells to mature NK cells. Thus, the response asserts that claim 29 can be considered as having a special technical feature that unifies them. This is not found persuasive because the restriction between Groups I and II is proper. The two groups are not linked by a special technical feature and do not relate to a single inventive concept. Group I is directed to a screening assay to identify a gene regulating differentiation from stem cells to natural killer cells. Group II does not share method steps with Group I. Accordingly, there is no subject matter in common between the two groups, and unity of invention is lacking. Applicant has not provided a special technical feature that links Groups I and II, which are set forth in the Office action mailed 12/23/2008. With respect to the species election requirement, the response

asserts that the species are linked by a special technical feature, because the genes have common activity in differentiating premature NK cells to mature NK cells, and this common activity was not recognized. This argument is not found persuasive, because the different genes are claimed in Markush-type format. When the Markush grouping is for alternatives of chemical compounds, they shall be regarded as being of similar nature when the following criteria are fulfilled: (A) all alternatives have a common property or activity; and (B) (1) a common structure is present, i.e., a significant structural element is shared by all alternatives; or (B)(2) all alternatives belong to a recognized class of chemical compounds in the art to which the invention pertains. In the instant case, the claimed nucleic acid molecules do not belong to a recognized class of chemical compounds. Each nucleic acid molecule encodes a protein with unique biological function, which is evidenced by the names of the genes that describe different functions (e.g., matrix metalloproteinase 12, tumor necrosis factor receptor 1, lipoprotein lipase, etc.). Applicant acknowledges that the asserted common activity was not recognized. Furthermore, the only common structure shared by each nucleic acid molecule is the sugar-phosphate backbone. The polynucleotides are not homologous to each other. The sugar-phosphate backbone cannot be considered a significant structural element, since it is shared by all nucleic acid molecules. Therefore, the recited genes do not share any significant structural element and cannot be considered as having the same or corresponding technical feature.

The requirement is still deemed proper and is therefore made FINAL.

Claims 29-31, 35 and 36 are under consideration as they read on the elected species of ferritin H chain (BC012314).

Priority

Acknowledgment is made of applicant's claim for foreign priority based on an application 10-2004-0004308 filed in The Republic of Korea on 1/20/2004. Where applicant has complied with PCT Rule 17, the International Bureau will forward a copy of the certified priority document to each Designated Office that has requested such document with an indication that the priority document was submitted in compliance with the rule and the date the document was received by the International Bureau. In the instant case, inspection of the file for PCT/KR05/00188 reveals that Applicant did not comply with PCT Rule 17. The International Bureau has not forwarded a copy of the certified priority document. If the International Bureau is unable to forward a copy of the certified priority document to the U.S. Patent and Trademark Office because applicant failed to comply with PCT Rule 17(a)-(b), then applicant will have to provide a certified copy of the priority document (or have the priority document furnished in accordance with 37 CFR 1.55(d)) during the national stage to fulfill the requirement of 37 CFR 1.55(a)(2). In the instant case, applicant will have to provide a certified copy of the priority document.

Information Disclosure Statement

Receipt of information disclosure statements, filed on 7/19/2006 and 7/20/2006, is acknowledged. The signed and initialed PTO 1449s have been mailed with this action.

Drawings

The drawings are objected to because the description of FIG. 3a - FIG. 3f refers to colors in the drawings, where the cluster frequency over 80 was marked red, the frequency of 50-79 was marked yellow, the frequency of 30-49 was marked green, and the frequency under 29 was marked blue (page 21, lines 10-15). The color referred to in the brief description of the drawings cannot be seen in the black and white drawings. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. Alternatively, the brief description of the drawing can be amended such that it does not refer to colors that cannot be seen. The objection to the drawings will not be held in abeyance.

It is noted that color photographs and color drawings are not accepted unless a petition filed under 37 CFR 1.84(a)(2) is granted. Any such petition must be accompanied by the

appropriate fee set forth in 37 CFR 1.17(h), three sets of color drawings or color photographs, as appropriate, and, unless already present, an amendment to include the following language as the first paragraph of the brief description of the drawings section of the specification:

> The patent or application file contains at least one drawing executed in color. Copies of this patent or patent application publication with color drawing(s) will be provided by the Office upon request and payment of the necessary fee.

Color photographs will be accepted if the conditions for accepting color drawings and black and white photographs have been satisfied. See 37 CFR 1.84(b)(2).

Specification

The disclosure is objected to because it contains an embedded hyperlink and/or other form of browser-executable code. Applicant is required to delete the embedded hyperlink and/or other form of browser-executable code. See MPEP § 608.01. See page 5, line 10; page 19, line 12; and page 28, lines 10 and 17.

The use of the trademark GENBANK (page 5, line 12; page 11, line 13; page 19, line 3; page 28, line 1; page 31, line 18; page 32, lines 1, 2, 4 and 5; page 33, Table 3; page 35, Table 4; page 37, Table 5) has been noted in this application. It should be capitalized wherever it appears and be accompanied by the generic terminology.

Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

The disclosure is objected to because of the following informalities: (i) at page 3, line 3 and page 12, line 18, the publication year of the cited Breast Cancer Res Treat. article is 2001,

not 2003; and (ii) page 46, line 9 refers to the nucleotide sequence of SEQ ID NO: 48, but SEQ ID NO: 48 is an amino acid sequence.

Appropriate correction is required.

The attempt to incorporate subject matter into this application by reference to GenBank Accession No. BC012314 is ineffective because essential material may be incorporated by reference, but only by way of an incorporation by reference to a U.S. patent or U.S. patent application publication, which patent or patent application publication does not itself incorporate such essential material by reference. The original claims present on the filing date are accepted as clear intent to incorporate the sequence by reference; however, essential material cannot be incorporated from the GenBank database.

The incorporation by reference will not be effective until correction is made to comply with 37 CFR 1.57(b), (c), or (d). If the incorporated material is relied upon to meet any outstanding objection, rejection, or other requirement imposed by the Office, the correction must be made within any time period set by the Office for responding to the objection, rejection, or other requirement for the incorporation to be effective. Compliance will not be held in abeyance with respect to responding to the objection, rejection, or other requirement for the incorporation to be effective. In no case may the correction be made later than the close of prosecution as defined in 37 CFR 1.114(b), or abandonment of the application, whichever occurs earlier.

Any correction inserting material by amendment that was previously incorporated by reference must be accompanied by a statement that the material being inserted is the material incorporated by reference and the amendment contains no new matter. 37 CFR 1.57(f).

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 29-31, 35 and 36 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Enablement is considered in view of the Wands factors (MPEP 2164.01(A)). These include: nature of the invention, breadth of the claims, guidance of the specification, the existence of working examples, state of the art, predictability of the art and the amount of experimentation necessary. All of the Wands factors have been considered with regard to the instant claims, with the most relevant factors discussed below.

Nature of the invention: Claims 29 and 35 are drawn to a method of differentiating a premature natural killer (pNK) cell into a mature natural killer (mNK) cell, comprising treating to premature natural killer cells, and effective amount of ferritin H chain (BC012314) gene (elected species). The nature of the invention is complex in that the administration of the ferritin H chain (BC012314) gene must be sufficient to induce differentiation of a pNK cell to an mNK cell.

Claims 30, 31 and 36 are drawn to a method of treating a cancer comprising administering to a patient in need of such treatment or prevention, an effective amount of ferritin H chain (BC012314) gene (elected species). Claim 31 limits the cancer to a cancer selected from

the group consisting of breast cancer, melanoma and lung cancer. The nature of the subject matter is complex, because the nucleic acid must be delivered at a level sufficient to produce a therapeutic outcome (see the discussion below) or to prevent cancer.

Furthermore, claims 29-31, 35 and 36 require the administration of the ferritin H gene claimed as GenBank accession number BC012314. Thus, the nucleic acid sequence of BC012314 is essential to the practice of the claimed invention. The specification discloses that the "mark in the bracket after the name of gene means GenBank ID implying sequence of each gene and the GenBank ID can be easily searched and used by the people in this field" (page 5, lines 11-14). Essential material may be incorporated by reference, but only by way of an incorporation by reference to a U.S. patent or U.S. patent application publication, which patent or patent application publication does not itself incorporate such essential material by reference. The original claims present on the filing date are accepted as clear intent to incorporate the sequence by reference; however, essential material cannot be incorporated from the GenBank database. The sequence of BC012314 is required to enable the method of administering the gene sequence.

Breadth of the claims: Claims 29 and 35 read on the administration of the ferritin H chain (BC012314) gene to cells *in vitro* or *in vivo*. Claims 30, 31 and 36 read on the administration of the ferritin H chain (BC012314) gene by any route of administration to any cell type. The complex nature of the subject matter of this invention is greatly exacerbated by the breadth of the claims.

Guidance of the specification: The specification asserts that ferritin H gene (BC012314) is a differentiation regulating agent for natural killer cells (e.g., page 6). The specification

asserts that the gene can be used to regulate the differentiation of pNK cells to mNK cells and to treat cancers (e.g., page 10, line 21 to page 12, line 23). The specification provides general guidance with regard to the administration of pharmaceutical formulations and envisions the use of oral or parenteral administration of the gene (e.g., page 12, line 25 to page 14, line 8).

The specification teaches the isolation of hematopoietic stem cells (HSCs) from the tibia and femur of a C57BL/6 mouse (e.g., paragraph bridging pages 22-23). The cells had over 96% purity (e.g., page 23, lines 9-13). The specification teaches that the mouse HSCs can be differentiated *in vitro* to pNK cells and further differentiated *in vitro* to mNK cells (e.g., page 23, line 15 to page 24, line 24). To differentiate the HSCs to pNK cells, the HSCs were cultured in RPMI complete medium supplemented with mouse SCF, mouse Flt3L, mouse IL-7, indomethacin, gentamycin and 10% fetal bovine serum (e.g., paragraph bridging pages 23-24). After 6 days in culture, the cells had differentiated to form pNK cells, which are CD122+ cells. The cells had over 92% purity (e.g., paragraph bridging pages 23-24). To induce the differentiation of pNK cells to mNK cells, the CD122+ cells were incubated with OP9 stromal cells in the presence of mouse IL-15. On day 12, NK1.1+ cells were obtained (e.g., page 24, lines 11-24). The specification teaches the analysis of gene expression from HSCs, pNK and mNK cells using Serial Analysis of Gene Expression (SAGE) (e.g., page 26, line 9 to page 39, line 1). The specification discloses 30 different genes that were identified by the SAGE procedure as specifically expressed at the pNK cell stage. These genes are recited in Table 4 at pages 35-37 of the specification. Ferritin H chain (BC012314) is included in this table at row 2. Further, the expression of Ferritin H chain was studied by RT-PCR using the primers disclosed as SEQ ID NOs: 27 and 28 (e.g., page 39, line 1 to page 41, line 18). By RT-PCR analysis

ferritin H chain (BC012314) expression was detected in HSC, pNK, mNK (-OP9) and mNK (+OP9) (Figure 4B).

Existence of working examples: No working examples of the claimed method are provided. No working examples are provided that demonstrate the ability of ferritin H chain (BC012314) to induce pNK cells differentiation to form mNK cells in the absence of other factors (e.g., the cytokines used in the disclosed culture conditions or alteration in the expression of other genes that are disclosed as being involved in the differentiation process). Treatment of cancer by ferritin H chain (BC012314) was not demonstrated using any model system for any type of cancer, including the claimed cancer types of breast cancer, melanoma and lung cancer.

Predictability and State of the art: The state of the art with regard to involvement of ferritin H gene in controlling the differentiation of pNK cells to mNK cells was underdeveloped at the time the invention was made. The prior art teaches that ferritin is a ubiquitous and highly conserved iron-binding protein composed of two subunits termed H and L (Torti et al. The Journal of Biological Chemistry, Vol. 263, No. 25, pages 12638-12644, 1988; e.g., page 12638, right column, 3rd full paragraph). Torti et al teach that ferritin functions in the storage and delivery of iron for intracellular use, and it functions in detoxification of elemental iron, which is toxic in a non-complexed form (e.g., page 12638, right column, 3rd full paragraph). Thus the prior art does not provide clear support for a role for ferritin H chain (BC012314) in natural killer cell differentiation, and the specification does not provide evidence that increased expression of ferritin H chain (BC012314) by delivering a nucleic acid molecule comprising the sequence of BC012314 to pNK cells will be sufficient to induce differentiation to mNK cells. Accordingly, the effects of exogenous BC012314 expression in pNK cells would have been

unpredictable.

It would have been unpredictable to use the expression of ferritin H chain (BC012314) to treat any form of cancer, including breast cancer, melanoma and lung cancer. The prior art teaches that ferritin H chain expression is increased in cancer. Wu et al (Carcinogenesis, Vol. 18, No. 1, pages 47-52, 1997) teach that studies have suggested a correlation may exist between ferritin in cancer in that serum ferritin level, particularly the H subunit, is frequently elevated in patients with cancer (e.g., page 47, right column, 1st full paragraph). Wu et al teach that ferritin-H mRNA overexpression was observed in an experimental model of mouse hepatocellular carcinoma, and the overexpression was not general to increased proliferation, because liver regeneration did not induce ferritin-H mRNA overexpression (e.g., page 50, paragraph bridging columns; paragraph bridging pages 50-51). Further, Wu et al teach that ferritin H chain overexpression has been observed in the SW 613-S human colon cancer cell line and rat models of hepatocellular carcinoma (e.g., page 51, left column, last full paragraph). The prior art also reported secretion of ferritin H chain from melanoma cells (Gray et al. Clinical Cancer Research Vol. 9, pages 2551-2559, July 2003; e.g., Abstract; paragraph bridging pages 2551-2552; paragraph bridging pages 2557-2558). Yang et al (Anticancer Research, Vol. 21, pages 541-549, 2001) teach that ferritin H chain mRNA was directly related to axillary lymph node status, presence of metastatic disease, and clinical stage in breast cancer (e.g., page 547, paragraph bridging columns). Further, Yang et al (2001) teach that the expression of transferrin protein was correlated with progression and metastasis as one moves from nevocellular nevi to dysplastic nevi to primary tumors to metastatic melanoma lesions (e.g., page 547, left column, 1st full paragraph). Moreover, Yang et al (Expert Opin. Ther. Targets, Vol. 6, No. 3, pages 375-

385, 2002) teaches that ferritin heavy chains upregulated in breast cancer cells have been shown to be effective targets for antisense therapy, where antisense therapy has an inhibitory effect on the growth of breast cancer cells (e.g., page 379, section 2.11). Accordingly, it would be unpredictable to administer the ferritin H chain (BC012314) gene by oral or parenteral administration for the treatment of cancer, when the gene is upregulated in cancer and antisense inhibition of ferritin H chain has been shown to decrease the growth of cancer cells.

An analysis of the prior art as of the effective filing date of the present application shows the complete lack of documented success for any treatment based on gene therapy. In a review on the current status of gene therapy, both Verma et al (Nature, Vol. 389, pages 239-242, 1997; e.g. page 239, paragraph 1) and Palù et al (J. Biotechnol. Vol. 68, pages 1-13, 1999; e.g. Abstract) state that despite hundreds of clinical trials underway, no successful outcome has been achieved. The continued, major obstacles to successful gene therapy are gene delivery and sustained expression of the gene. Regarding non-viral methods for gene delivery, Verma et al (1997) indicate that most approaches suffer from poor efficiency and transient expression of the gene (e.g. page 239, right column, paragraph 2). Likewise, Luo et al (Nature Biotechnology, Vol. 18, pages 33-37, 2000) indicate that non-viral synthetic delivery systems are very inefficient (e.g. Abstract; page 33, left column, paragraphs 1 and 2). Around the time the invention was made, the art indicates that gene therapy methods still suffer from inefficient gene transfer (Verma and Weitzman, Gene Therapy: Twenty-first century medicine. Annual Review of Biochemistry, Vol. 74, pages 711-738, 2005; e.g. page712, last paragraph). Regarding viral methods for gene delivery *in vivo*, Verma et al (1997), indicate that lentiviral, adenoviral and AAV vectors are capable of delivery genes, but there is a possibility for insertional mutagenesis

or toxicity due to an inflammatory response (e.g. Table 2). The skilled artisan at the time the present invention was made recognized the difficulty of achieving sufficient heterologous gene expression to induce any therapeutic effect. Gene therapy is still a technique of the future and advancements in our understanding of the basics of gene delivery and expression must be made before gene therapy becomes a useful technique (e.g. Verma et al, p. 242, col. 2-3; Palù et al, pp. 10-11; Luo et al, p. 33, col. 1, 1st paragraph; Verma and Weitzman, page 732, 2nd full paragraph).

Amount of experimentation necessary: The quantity of experimentation necessary to carry out the claimed invention is high, as the skilled artisan could not rely on the prior art or the present specification to teach how to make and use the claimed methods. First, the essential sequence of ferritin H chain (BC012314) would need to be provided in order to be able to deliver the gene to any cell. Second, one would be required to perform a large amount of trial and error experimentation to use the ferritin H chain (BC012314) gene to induce the differentiation of pNK cells to mNK cells. The prior art does not teach a role for ferritin H chain in the differentiation of NK cells, the specification does not provide evidence that ferritin H chain alone is sufficient to induce NK cell differentiation, and the specification teaches detectable expression of ferritin H chain in HSCs, pNK cells, and mNK cells by RT-PCR. Third, one would have to determine how to deliver the ferritin H chain (BC012314) gene to the appropriate target cells with specificity and efficiency, and how to get sufficient expression to induce at least some therapeutic effect. Further, one would have to conduct additional experimentation to extend the use of the ferritin H chain gene to the prevention of any form of cancer. Since neither the prior art nor the specification provides the answers to all of these questions, it would require a large quantity of trial and error experimentation by the skilled artisan to do so.

In view of the breadth of the claims and the lack of guidance provided by the specification as well as the unpredictability of the art, the skilled artisan would have required an undue amount of experimentation to make and/or use the claimed invention. Therefore, claims 29-31, 35 and 36 are not considered to be enabled by the instant specification.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer Dunston whose telephone number is 571-272-2916. The examiner can normally be reached on M-F, 9 am to 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christopher Low can be reached at 571-272-0951. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Jennifer Dunston, Ph.D.
Examiner
Art Unit 1636

/Jennifer Dunston/
Examiner, Art Unit 1636